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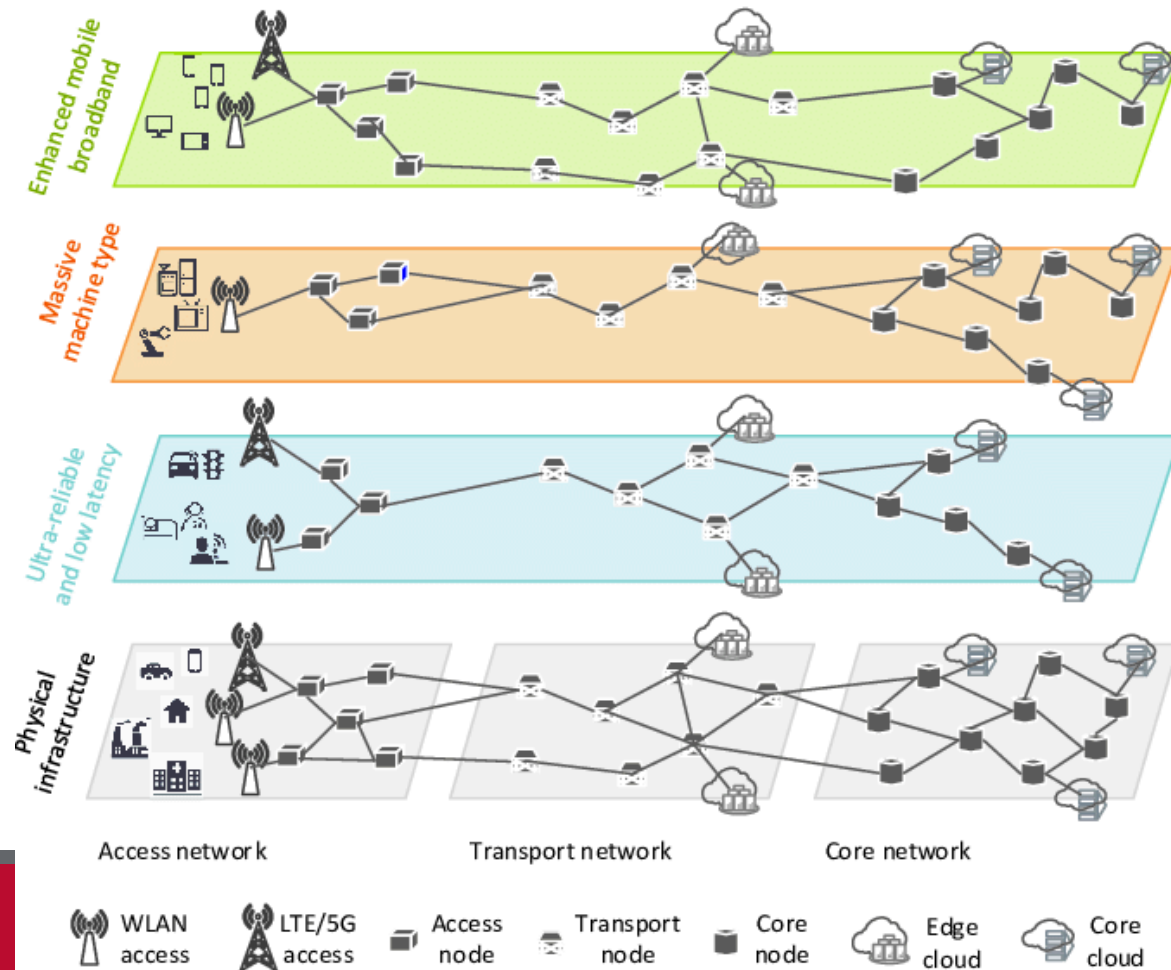
# ECE-595 Network Softwarization

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# 5G Network Slicing



Guan et al, «A Service-Oriented Deployment Policy of End-to-End Network Slicing Based on Complex Network Theory», April 2018

# 5G Network Slicing in a Nutshell

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## Network Slice is

- a logical end-to-end network
- created in an as-a-Service fashion

## Different Network Slices for different services types

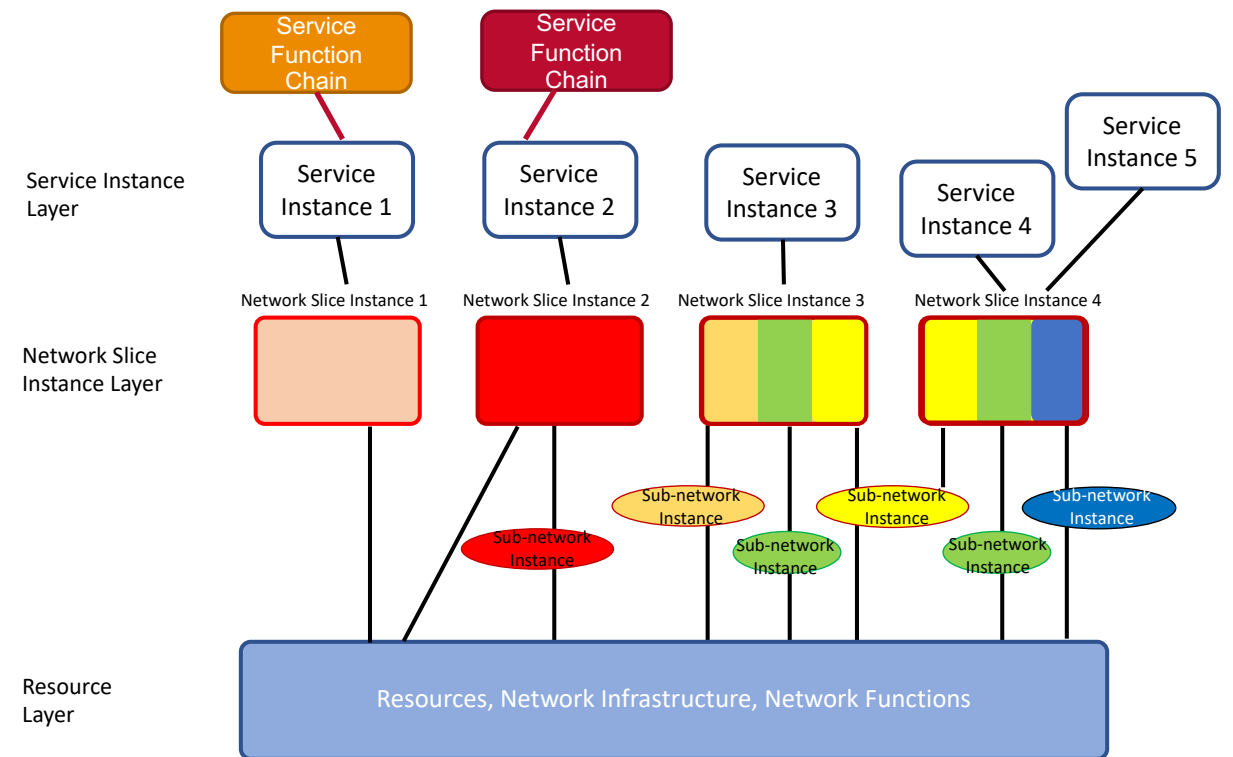
- committed service → Network Slice type
- dedicated customers

## A Network Slice can include

- 5G Core Network
- 5G Radio Access Network
- Interworking Functions to non-3GPP Access Networks

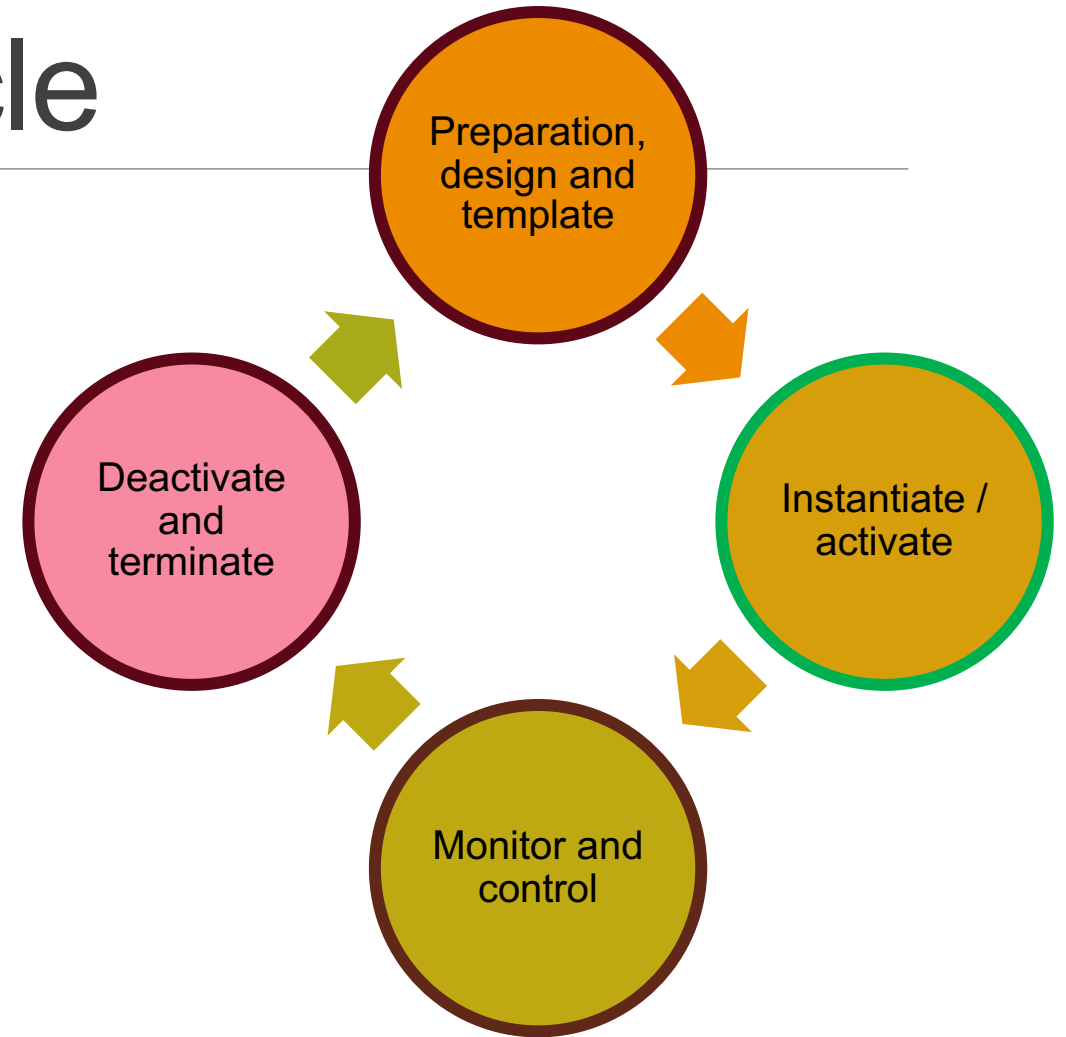
# The Network Slicing Concept

- **Network slicing** – new value creation opportunities (vertical segments)
  - enables a concurrent deployment of **multiple logical, self-contained networks** on a common physical infrastructure platform with **diverse business demands**
  - offers **dedicated resources** that can be used in an isolated, disjunctive or shared manner and a **customized network operation**
  - supports **flexible, on-demand** provision of network resources, network functions and applications, **even with short lifecycles** - resource physical or virtual

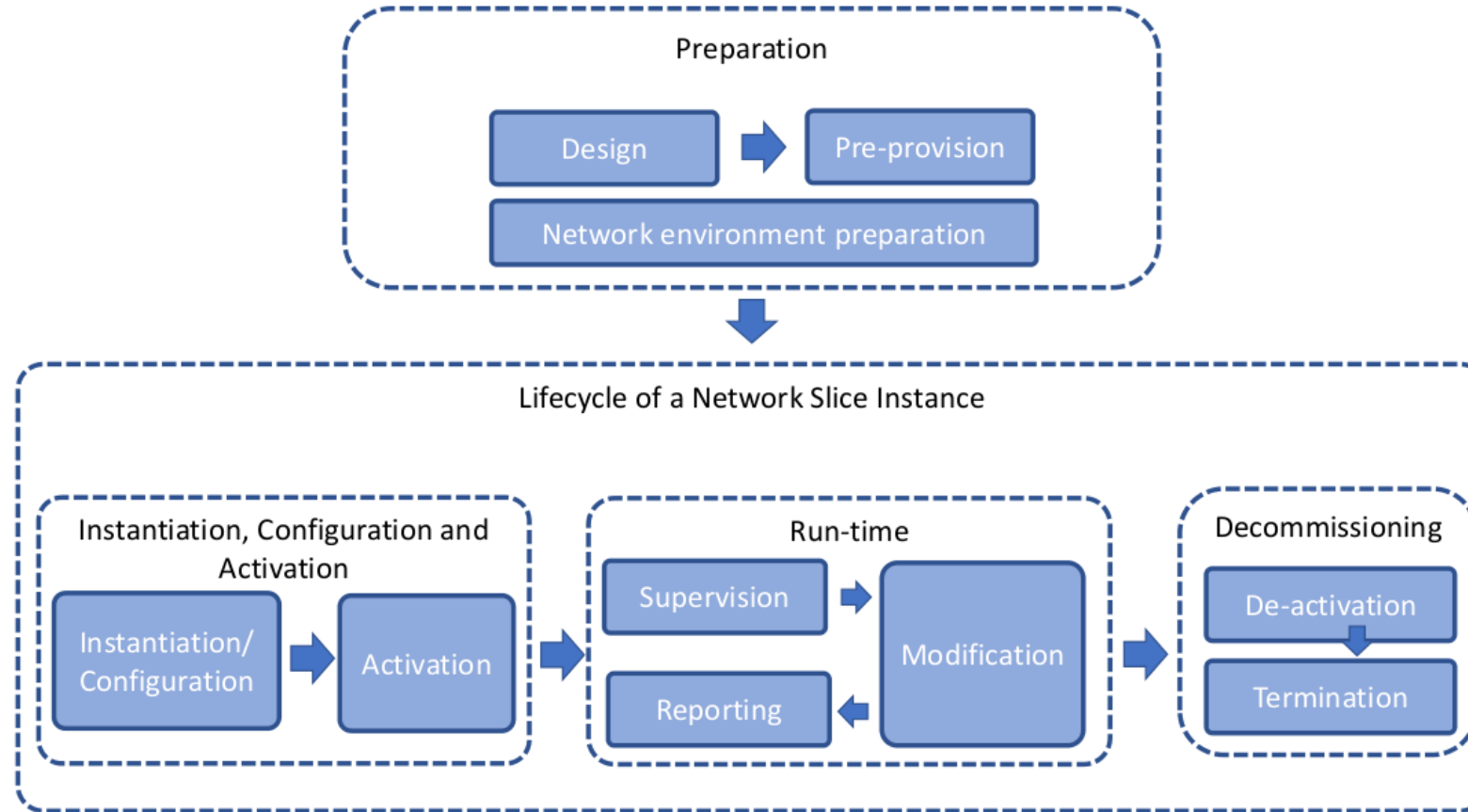


# Network Slice Lifecycle

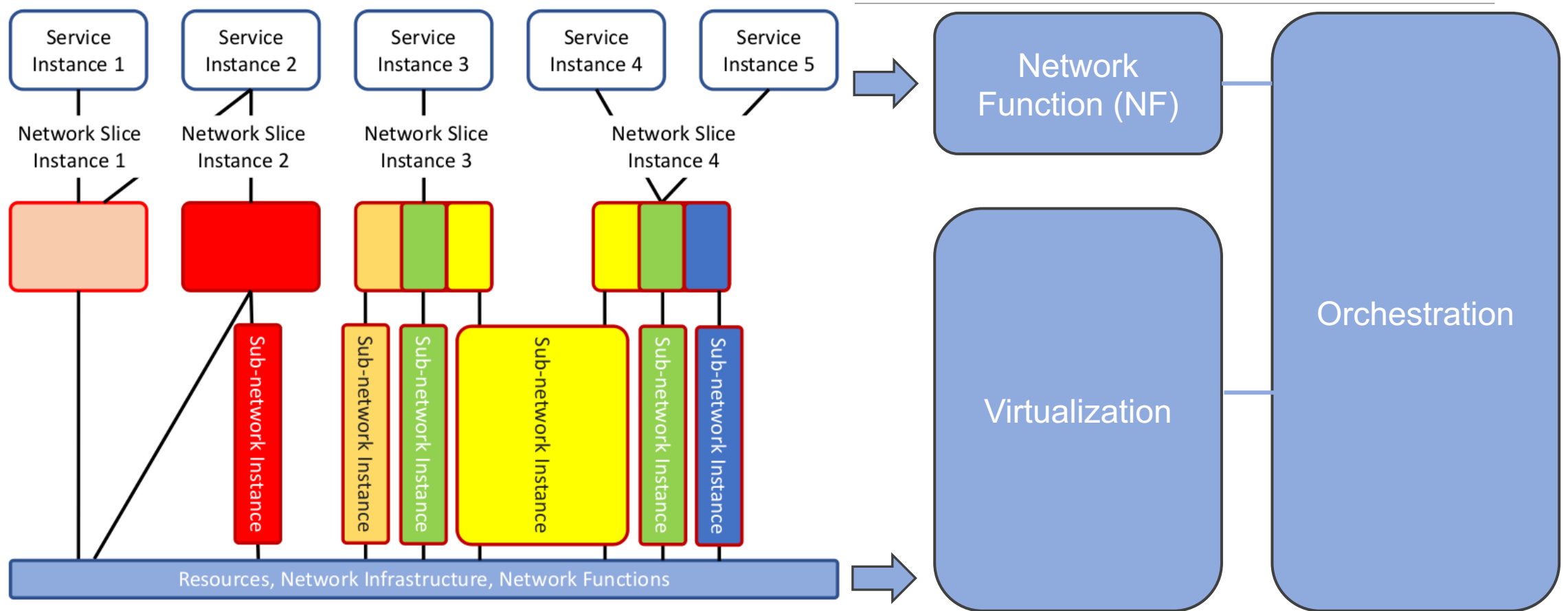
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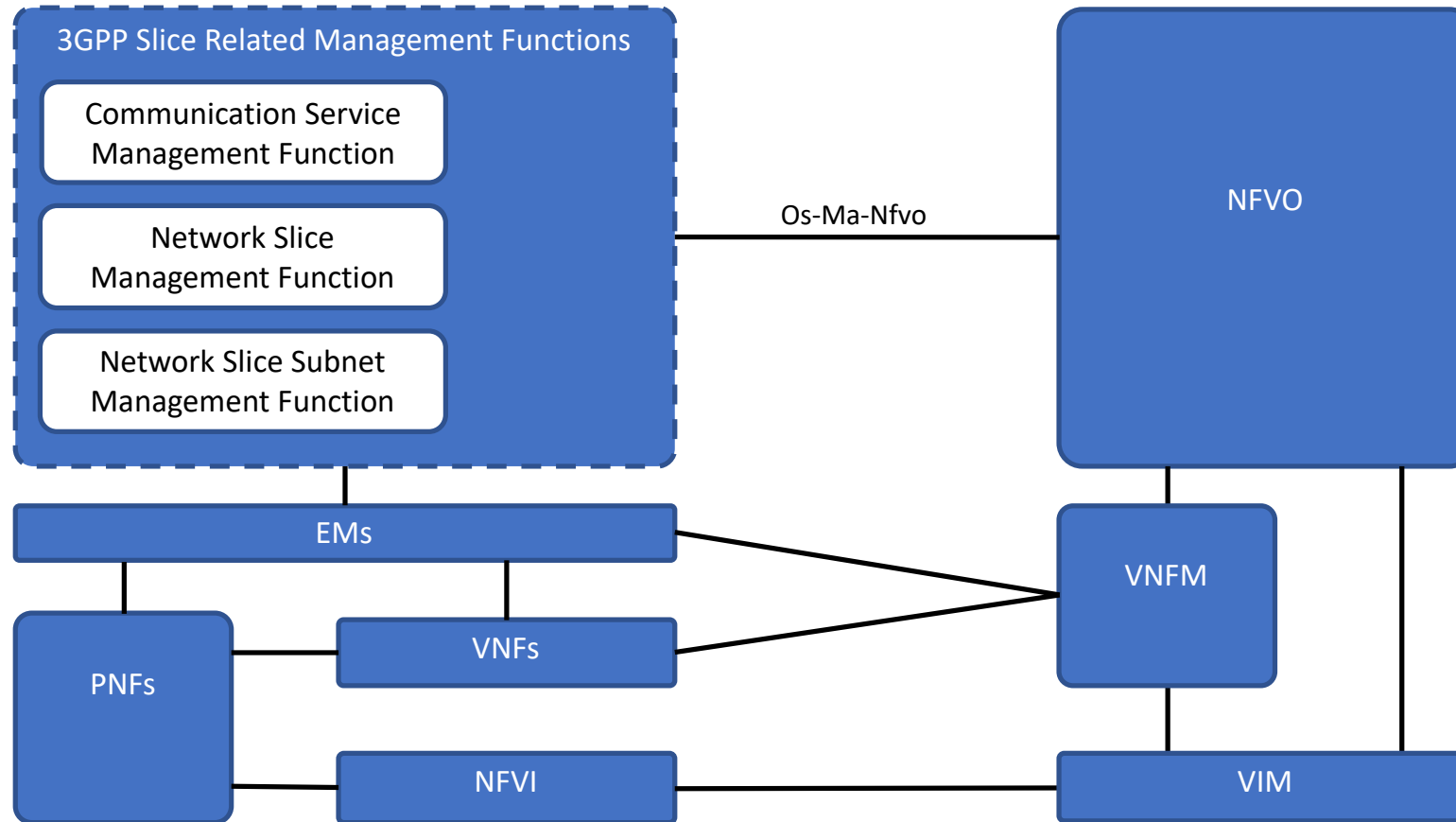
# Life Cycle of Network Slicing Components



# Techniques to Realize Network Slicing

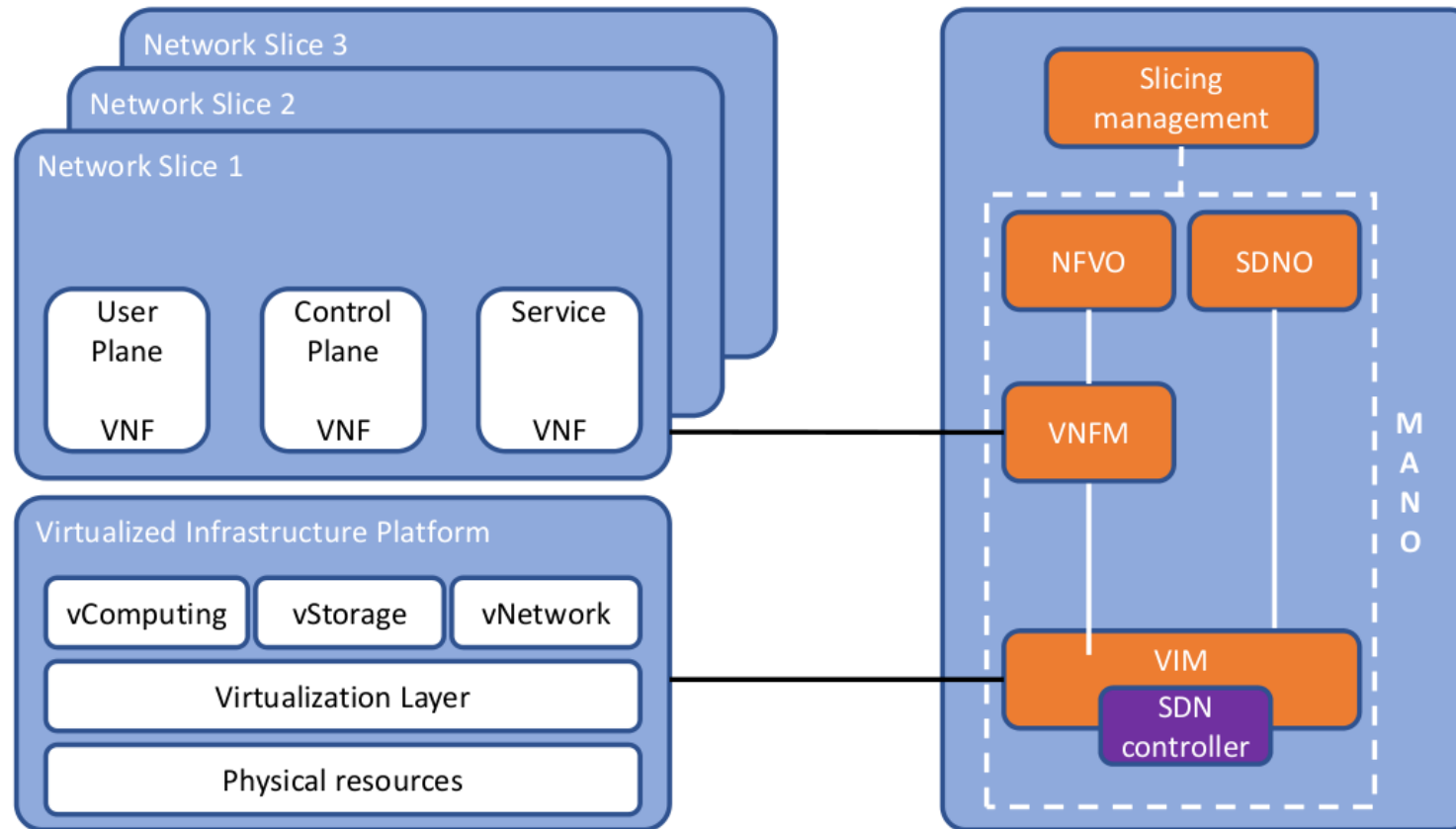


# Network Slicing Architecture

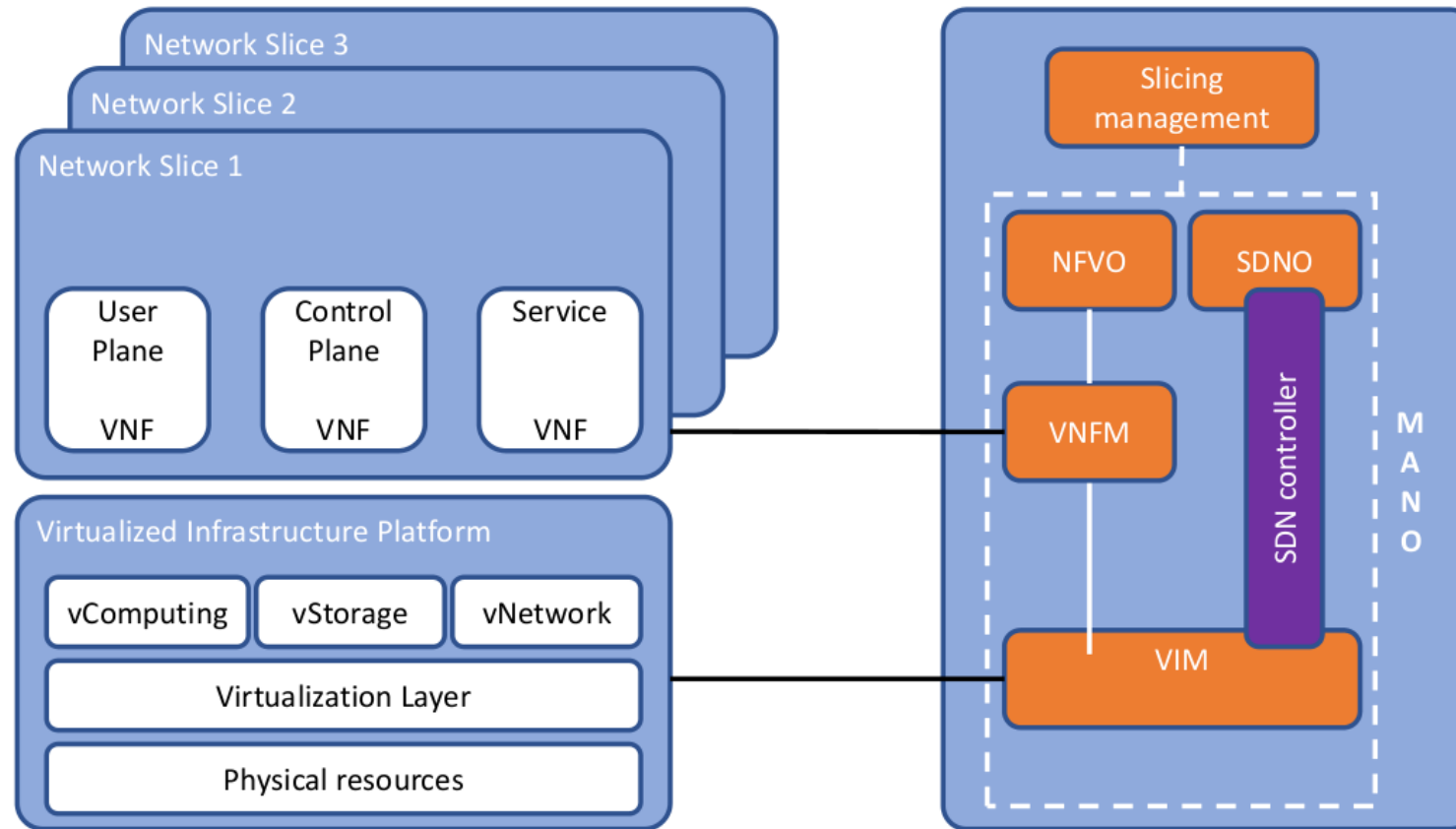




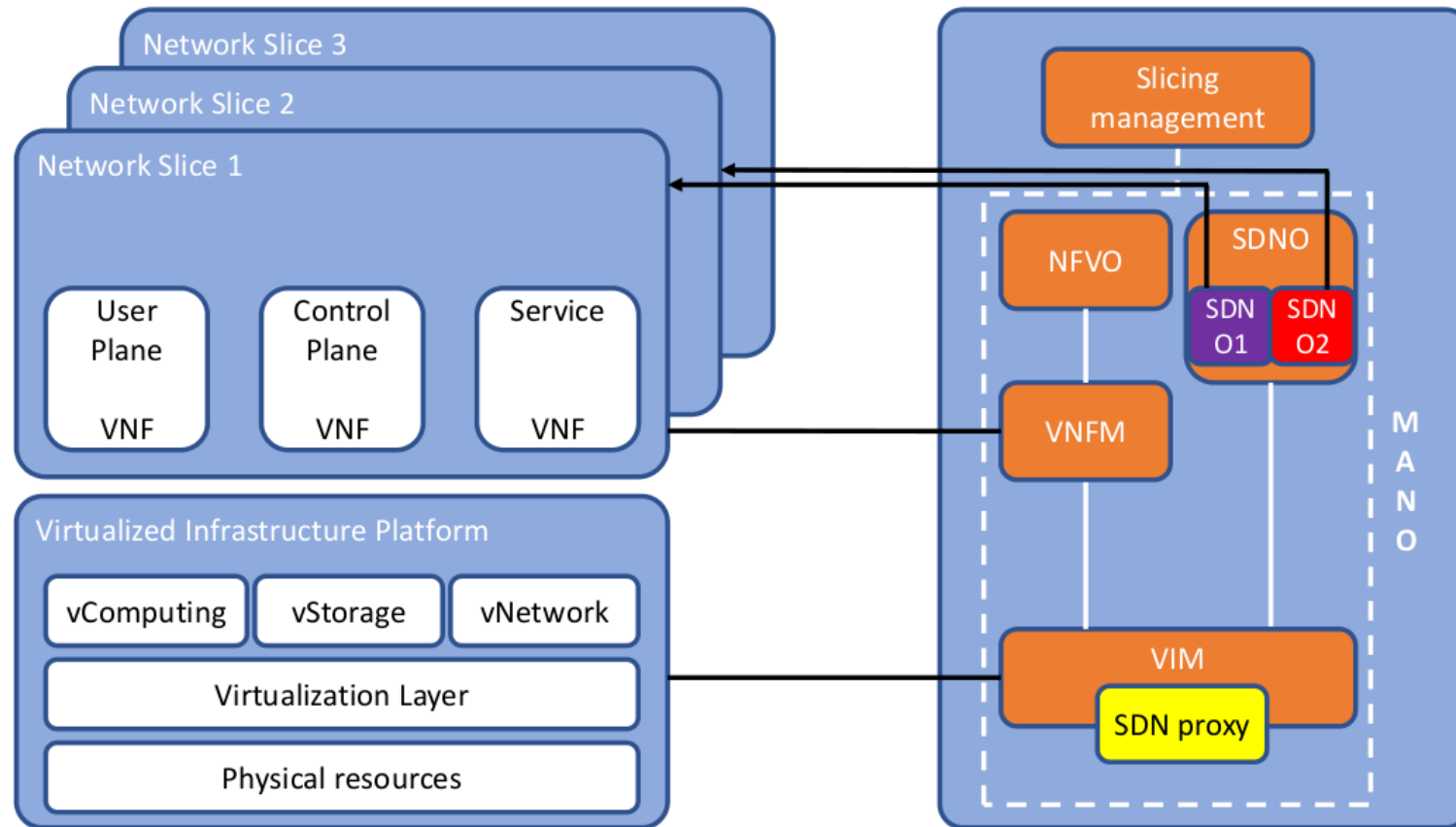
# Generic Architecture for Network Slicing



# Single Owner, Single Controller



# Single Owner, Multiple Tenants



# FlowVisor

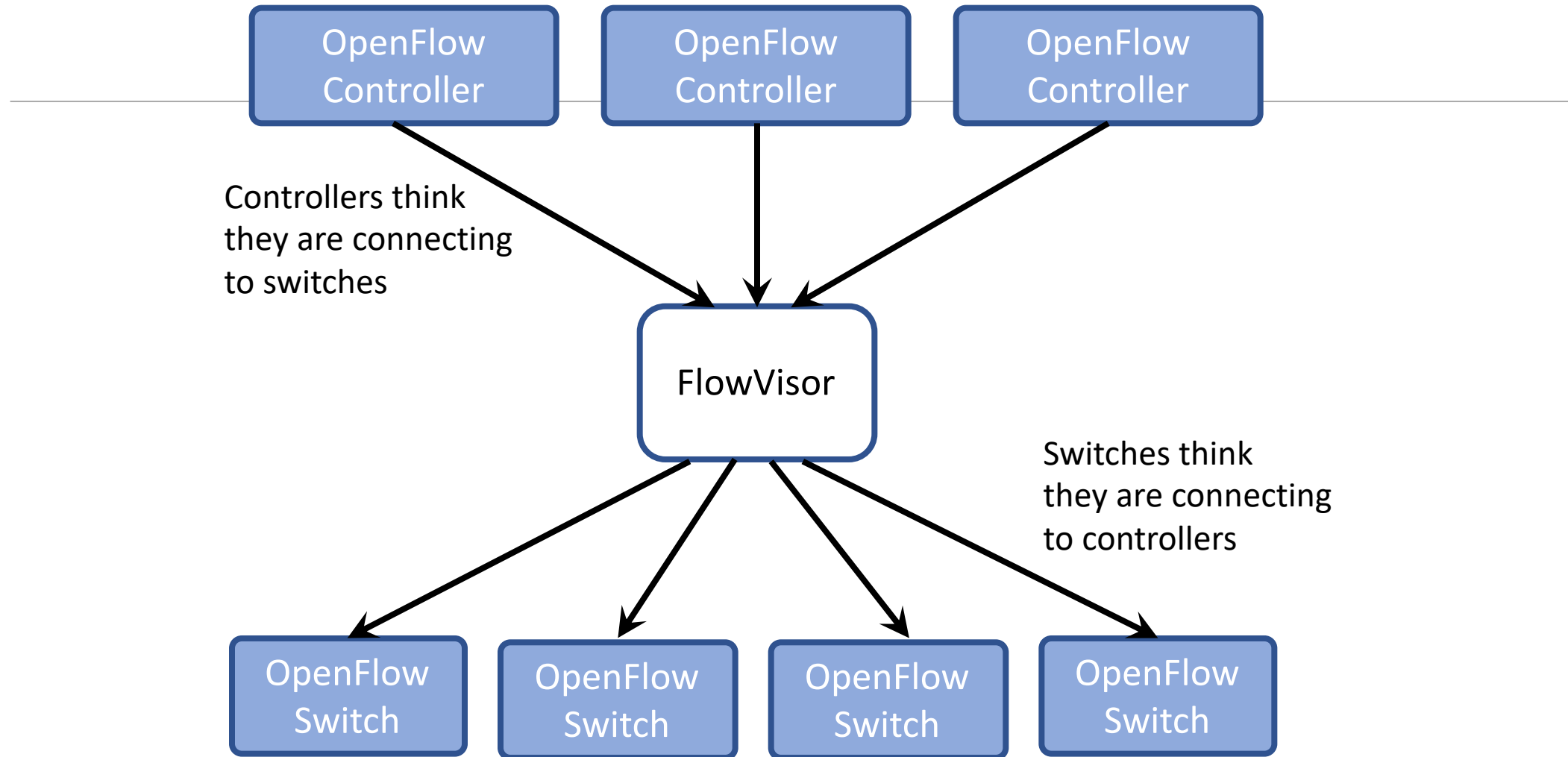
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FlowVisor uses OpenFlow as a hardware abstraction layer to sit logically between control and forwarding paths on a network device

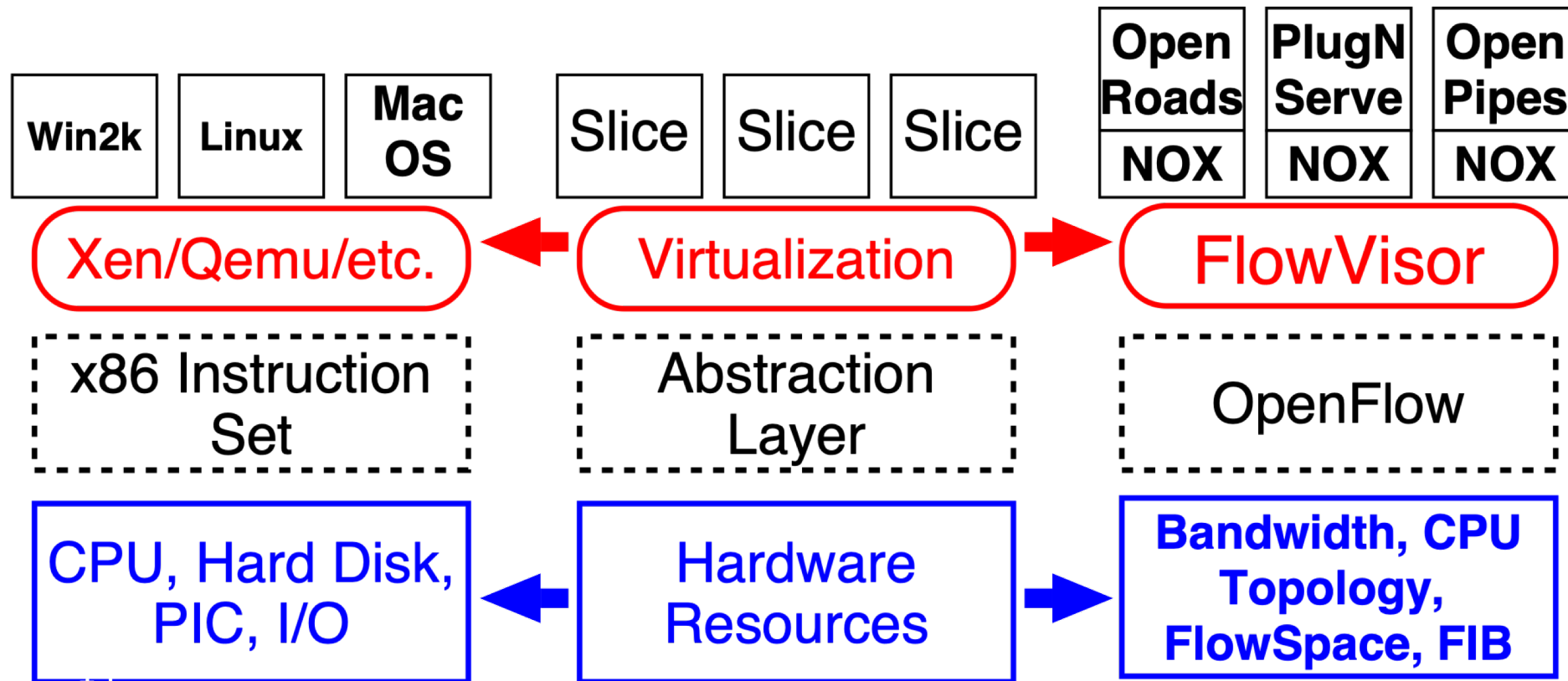
OpenFlow provides an abstraction of the networking forwarding path that allows FlowVisor to slice the network

“FlowVisor: A Network Virtualization Layer”, by Rob Sherwood, Glen Gibb, Kok-Kiong Yap, Guido Appenzeller, Martin Casado, Nick McKeown, Guru Parulkar, White paper, 2009.

# FlowVisor



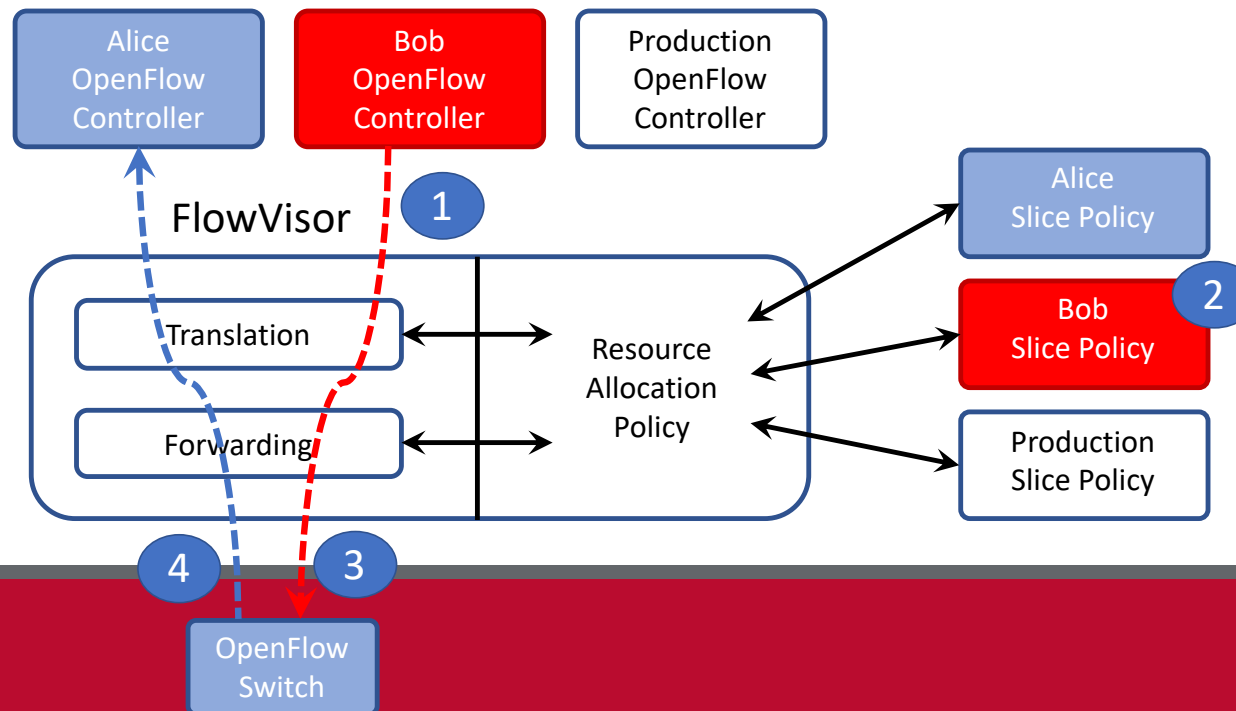
# FlowVisor concept



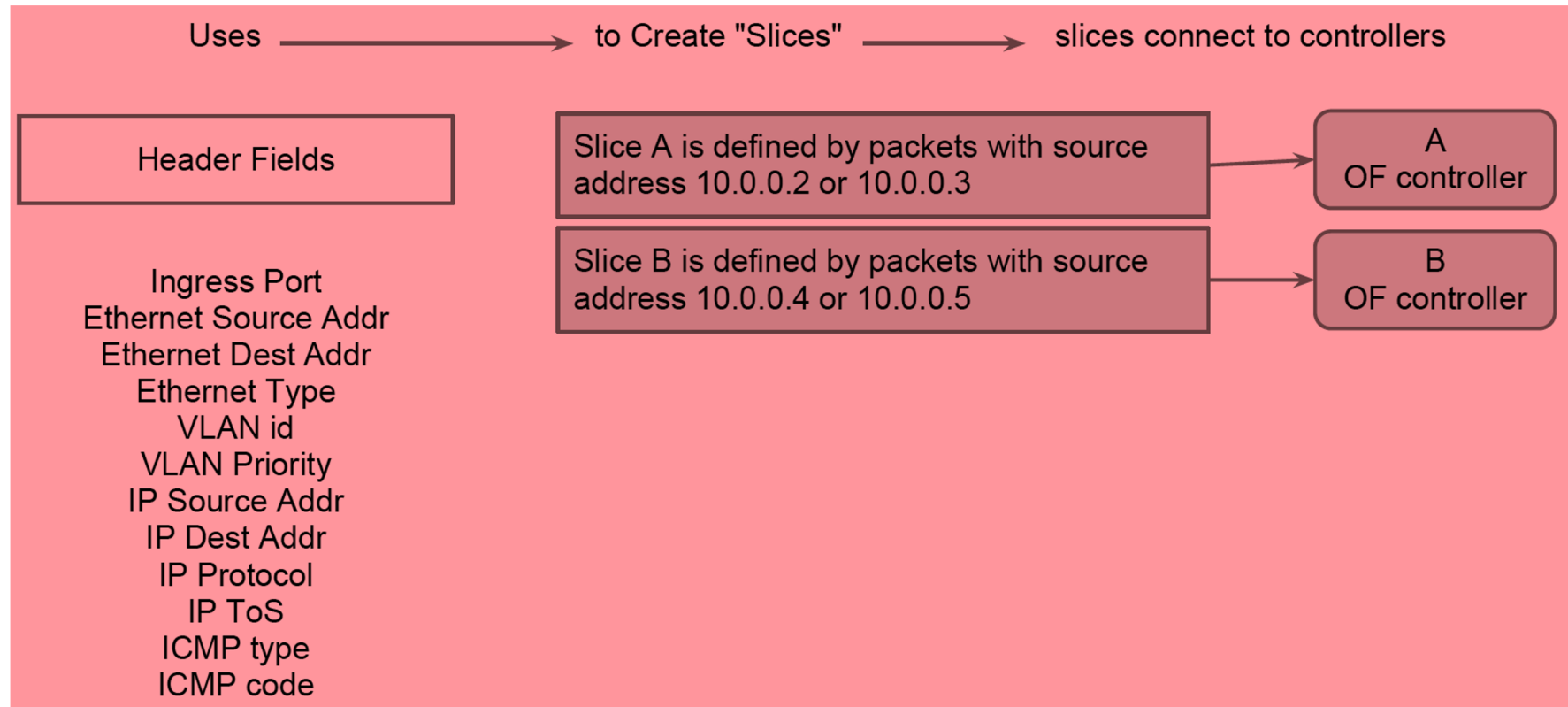
# FlowVisor concept

FlowVisor intercepts OpenFlow messages from guest controllers (1) and, using the user's slicing policy (2), transparently rewrites (3) the message to control only a slice of the network.

Messages from switches (4) are forwarded only to guests if it matches their slice policy

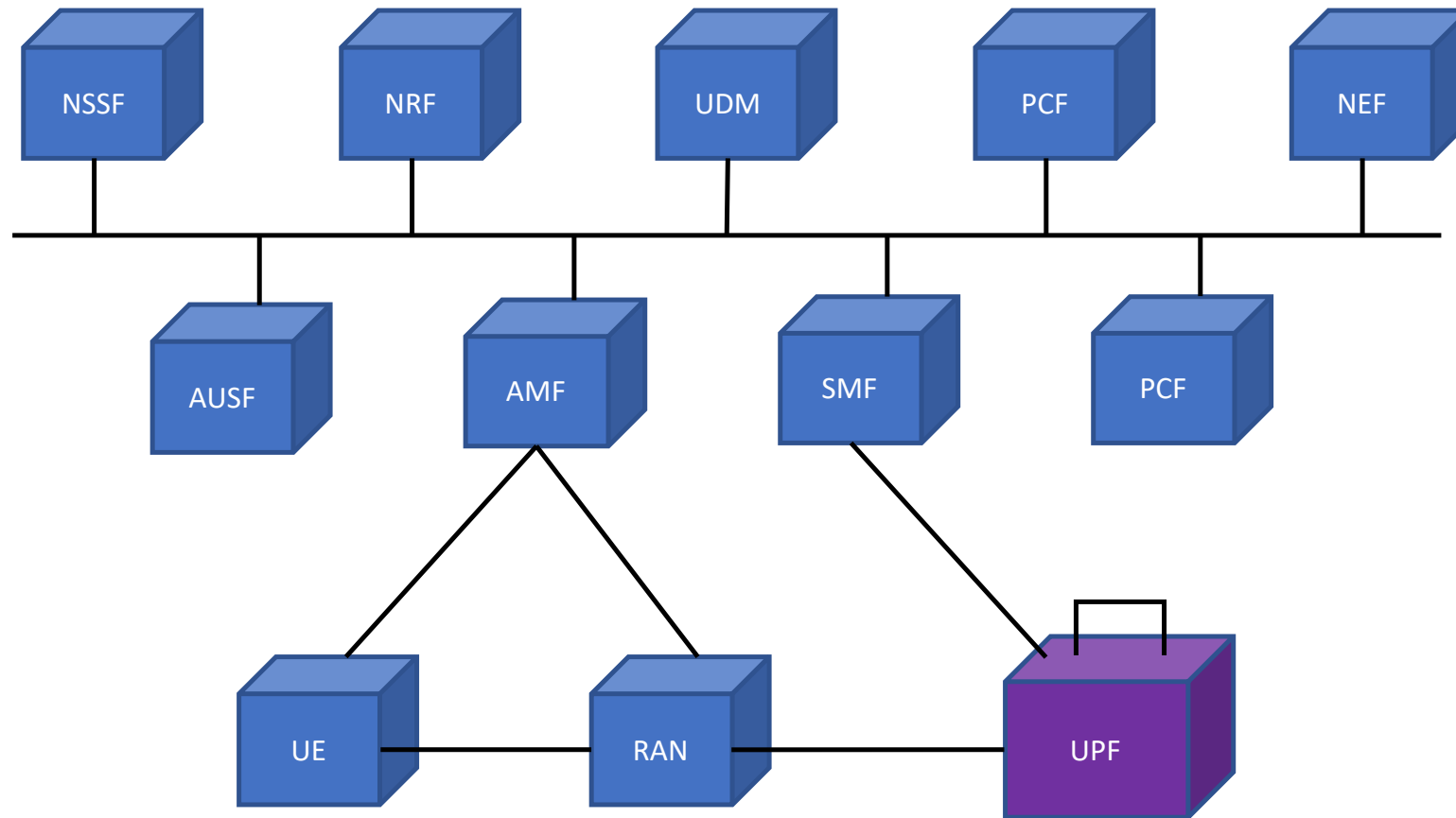


# FlowVisor example





# The 5G Service Based Architecture



# Network Slice Selection Function (NSSF)

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The NSSF supports the following functionality:

- Selecting the set of Network Slice instances serving the UE,
- Determining the Allowed NSSAI (Network Slice Selection Assistance Information) and, if needed, the mapping to the Subscribed S-NSSAIs (Single NSSAI),
- Determining the Configured NSSAI and, if needed, the mapping to the Subscribed S-NSSAIs,
- Determining the AMF Set to be used to serve the UE, or, based on configuration, a list of candidate AMF(s), possibly by querying the NRF.

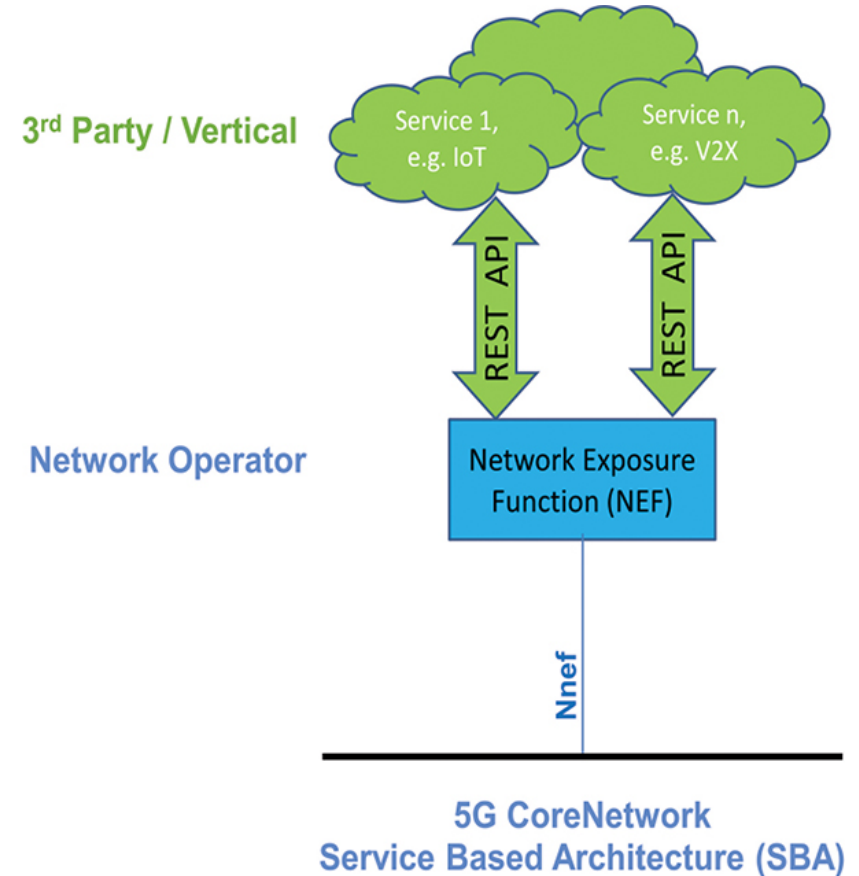
# Network Exposure Function (NEF)

Capability exposure is one of the key innovation aspects of the 5G specification.

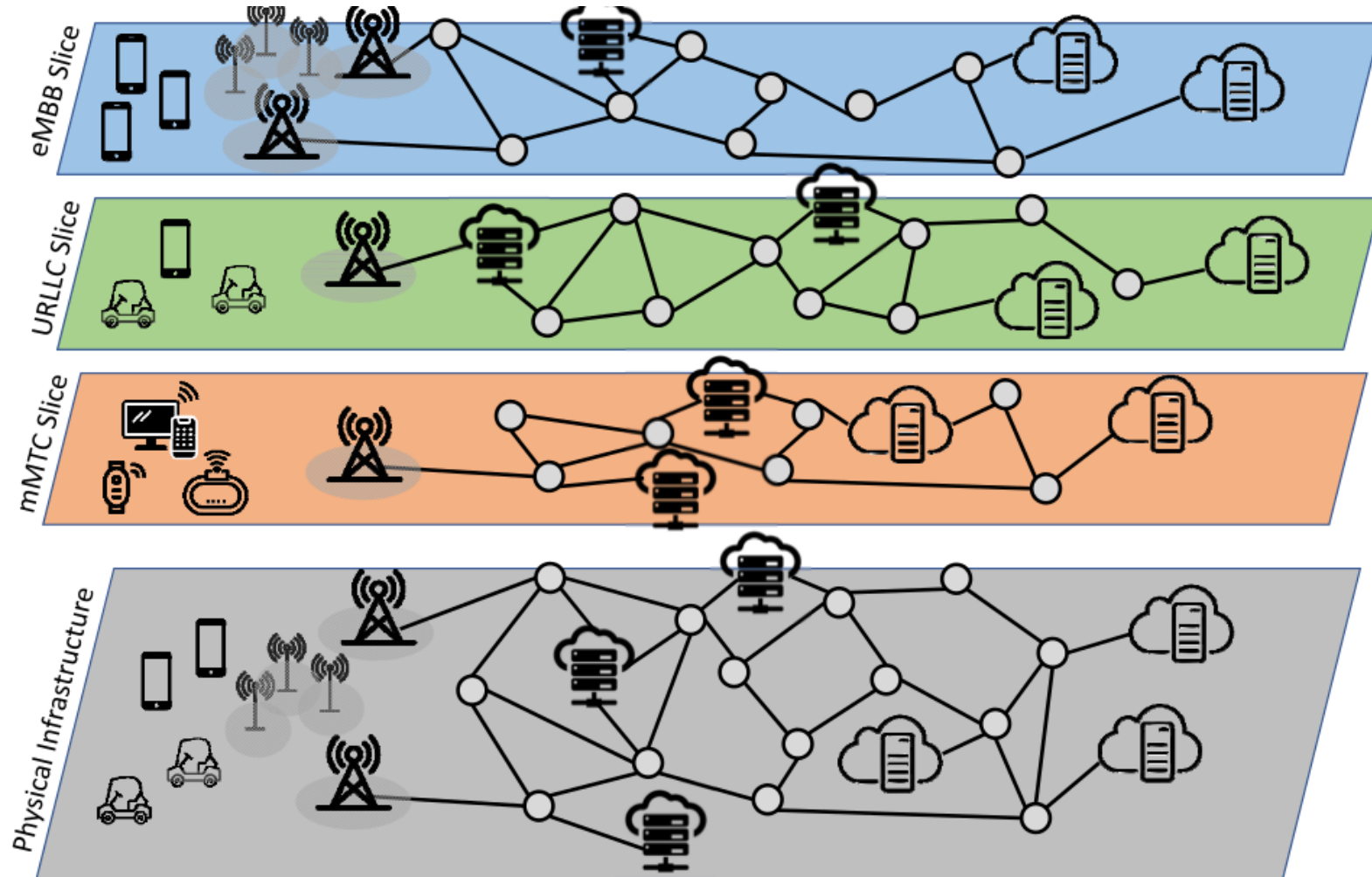
Capability exposure consists of making 5G Core Network functionalities available to 3<sup>rd</sup> parties such as service providers and vertical industries outside the operator's domain.

This capability is offered by the Network Exposure Function (NEF).

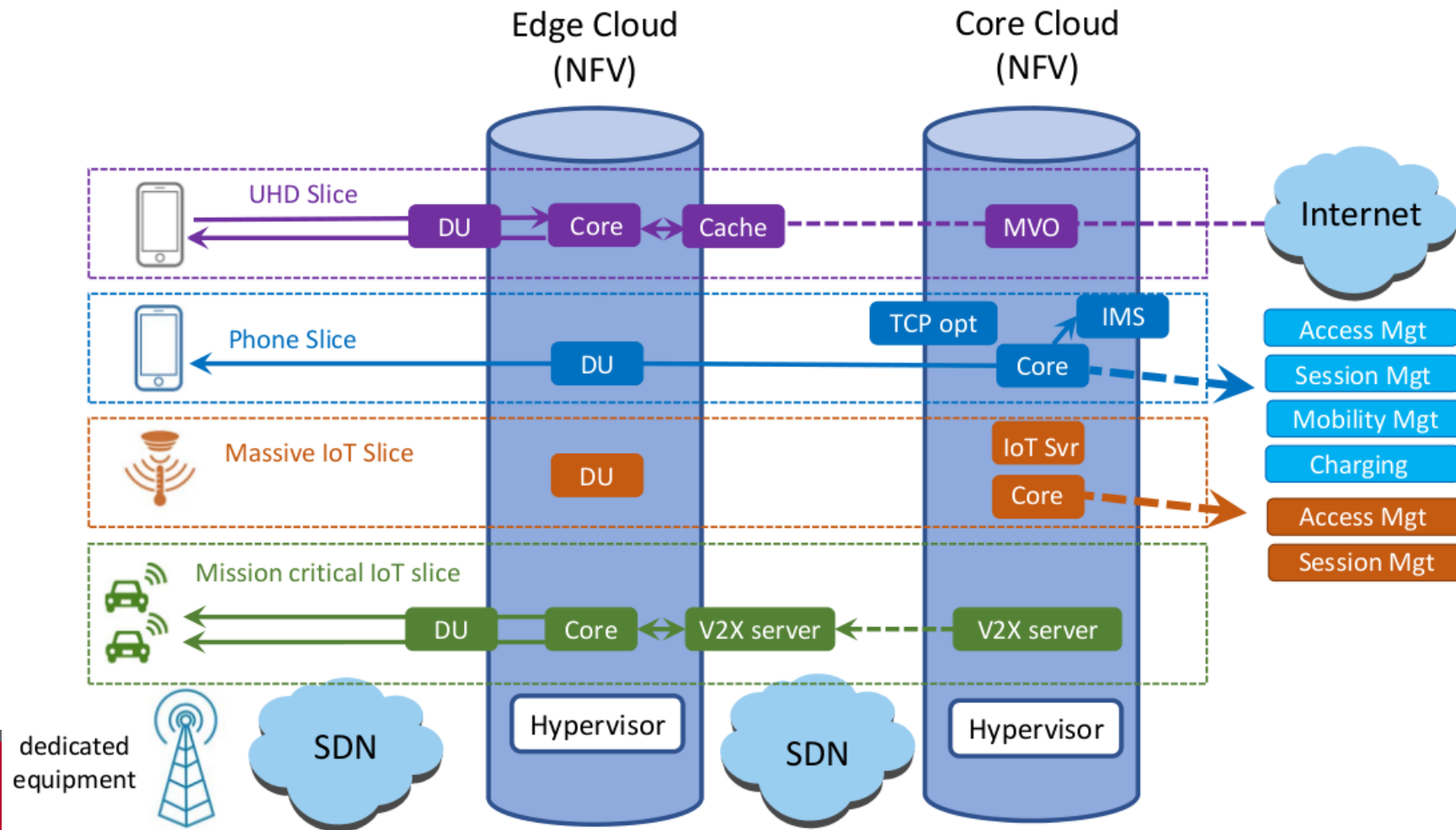
3GPP decided that 5G service exposure by the NEF should be based on RESTful APIs.



# 5G Use Cases



# 5G Use Cases



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